CLAIMS

1. (Previously Presented) A switching amplifier adapted to drive at least first and second reactive loads with first and second switching signals, respectively, each of said first and second switching signals having respective switching band components and at least one respective baseband component, the baseband components of the first and second switching signals being such that, and said loads being interconnected in such a way that, the sum of the values of the currents through said each load is substantially constant,

substantially all of said at least one baseband component of said first switching signal being a current that flows into said first reactive load and substantially all of said at least one baseband component of said second switching signal being a current that flows into said second reactive load,

wherein at least one of said reactive loads is a transducer.

2. Canceled.

3. (Previously Presented) The invention of claim 1 wherein there are N of said loads and wherein for each of a number of signal variables for each load, the sum of the values of each particular signal variable is substantially constant.

4. (Original) The invention of claim 3 wherein said number of signal variables is greater than 1 and less than N.

5. (Previously Presented) The invention of claim 1 wherein respective first terminals of each of said loads are connected to a common node through which said current at baseband frequencies flows, said common node being connected to a fixed potential.

6. (Original) The invention of claim 5 wherein each of said loads has a second terminal and wherein said switching amplifier further comprises means for applying at least the baseband components of said first switching signal between the second terminal of said first load and said common node and for applying at least the baseband components of said second switching signal between the second terminal of said second load and said common node.

7. (Previously Presented) The invention of claim 1 further comprising a mechanical load connected to said transducer.

8. (Original) The invention of claim 7 wherein said mechanical load includes means for generating acoustic sonar signals.

9. (Previously Presented) A switching amplifier adapted to drive at least first and second reactive loads with at least first and second switching signals, respectively, each of said at least first and second switching signals having respective switching band components and at least one respective baseband component, the baseband components of the at least first and second switching signals being such that, and said loads being interconnected in such a way that, substantially all of the current at baseband frequencies flowing out of one or more of said loads at a given time flows into one or more of the others of said loads,

substantially all of said at least one baseband component of said first switching signal being a current that flows into said first reactive load and substantially all of said at least one baseband component of said second switching signal being a current that flows into said second reactive load,

wherein at least one of said reactive loads is a transducer.

10. (Previously Presented) The invention of claim 9 further comprising means for connecting respective first terminals of each of said loads to a common power supply node through which said current at baseband frequencies flows.

11. (Original) The invention of claim 10 wherein each of said loads has a second terminal and wherein said switching amplifier further comprises means for applying at least the baseband components of said first switching signal between the second terminal of said first load and said common node and for applying at least the baseband components of said second switching signal between the second terminal of said second load and said common node.

12. (Withdrawn-Previously Presented) The invention of claim 11 wherein said switching amplifier is further adapted to drive a third reactive load with a third switching signal, said third switching signal having switching band components and at least one baseband component, said third load having a second terminal, and wherein said switching amplifier further comprises means for applying the at least one baseband component of said third switching signal between the second terminal of said third load and said common node.

13. (Original) The invention of claim 9 wherein said loads have substantially equal impedance and wherein said baseband components are the inverse of one another.

14. (Original) The invention of claim 9 wherein said switching amplifier includes at least one power supply terminal and wherein said current flowing out of one or more of said loads flows away from said power supply terminal and said current flowing into one or more of the others of said loads flows toward said power supply terminal.

15. (Original) The invention of claim 14 wherein the phases and amplitudes of said baseband components are such that said currents add to zero at substantially all times.

16. (Previously Presented) The invention of claim 14 wherein respective first terminals of each of said loads are connected to a common node through which said current at baseband frequencies flows, said common node being at a fixed potential.

17. (Original) The invention of claim 9 wherein there are two of said loads, wherein said two loads have substantially equal impedances and wherein the baseband components of said first and second switching signals are of substantially equal magnitude and are substantially the inverse of one another.

18. (Withdrawn) The invention of claim 9 wherein said switching amplifier is further adapted to drive a third reactive load with a third switching signal, wherein said first, second and third loads have substantially equal impedances and wherein the baseband components of said first, second and third switching signals are such that they add to zero at substantially all times.

19. (Previously Presented) The invention of claim 9 further comprising a mechanical load connected to said transducer.

20. (Original) The invention of claim 19 wherein said mechanical load includes means for generating acoustic sonar signals.

21. (Original) The invention of claim 9 wherein said switching amplifier includes at least first and second signal paths containing said first and second loads, respectively.

22. (Original) The invention of claim 21 wherein alternating polarity currents flow in said first and second signal paths in response to said first and second switching signals, respectively.

23. (Original) The invention of claim 22 wherein said first and second switching signals are generated in response to first and second pulse-width-modulated signals, respectively.

24. (Original) The invention of claim 21 wherein said switching amplifier further includes means for applying said first and second switching signals to said first and second signal paths, respectively, in such a way that at least one switching band component of said first switching signal and at least one switching band component of said second switching signal cancel each other and therefore are substantially isolated from said loads.

25. (Original) The invention of claim 24 wherein alternating polarity currents flow in said first signal path in response to said first switching signal and alternating polarity currents flow in said second signal path in response to said second switching signal.

26. (Original) The invention of claim 24 wherein

said at least one switching band component of said first switching signal and said at least one switching band component of said second switching signal are of substantially the same amplitude and phase, and

said means for applying comprises a common-mode inductor in said first and second signal paths.

27. (Withdrawn) The invention of claim 21 wherein said switching amplifier is further adapted to drive a third reactive load with a third switching signal, wherein said switching amplifier includes at least a third signal path containing said third load, and wherein said switching amplifier further includes means for applying said first, second and third switching signals to said first, second and third signal paths, respectively, in such a way that at least one switching band component of each of said first, second and third switching signals cancel each other and therefore are substantially isolated from said loads.

28. (Withdrawn) The invention of claim 27 wherein alternating polarity currents flow in said first signal path in response to said first switching signal, alternating polarity currents flow in said second signal path in response to said second switching signal, and alternating polarity currents flow in said third signal path in response to said third switching signal.

29. (Withdrawn) The invention of claim 27 wherein

said at least one switching band component of said first, second and third switching signals are of substantially the same amplitude and phase, and

said means for applying comprises a common-mode inductor in said first, second and third signal paths.

30. (Previously Presented) The invention of claim 21 wherein

each of said loads includes a first terminal and a second terminal,

the first terminals of each of said loads are connected to a common node through which said current at baseband frequencies flows, said common node being adapted to be connected to a fixed potential,

each said path includes filtering circuitry connected to the second terminal of the respective load, and

each of said first and second switching signals comprises an alternating polarity signal impressed across said first and second signal paths, respectively.

31. (Original) The invention of claim 21 wherein

each of said loads includes a first terminal and a second terminal,

the first terminals of each of said loads are connected to a common node through which said current at baseband frequencies flows, said common node being connected to a fixed potential,

each said path includes filtering circuitry connected to the second terminal of the respective load, and

said first and second switching signals comprise respective signals at first and second potentials applied to the filtering circuitry of said first and second signal paths, respectively.

32. (Original) The invention of claim 31 wherein

said second potential is substantially equal to said fixed potential, and

said filtering circuitry includes at least one energy storage element that stores energy when each said switching signal is at said first potential and that supplies energy to said loads when each said second node is connected to said second potential.

33. (Original) The invention of claim 32 wherein

said energy storage element is a common-mode inductor having first and second ports in said first and second paths, respectively, and

said first and second switching signals have respective switching band components that are of substantially equal magnitude and phase that are canceled by said common-mode inductor.

34. (Previously Presented) Apparatus comprising

two or more circuit paths each including a respective reactive load, each of said loads having a first terminal connected to the first terminal of each other load, at least one of said loads being a transducer,

means for generating for each of said circuit paths an associated pulse-width-modulated signal, each pulse-width-modulated signal alternating between a respective first level and a respective second level at a particular switching frequency, the pulse widths of the pulses of each pulse-width-modulated signal being determined by a respective baseband signal,

means responsive to each of said pulse-width-modulated signals for impressing an associated switching signal across the associated circuit path, said switching signal comprising first and second voltages impressed across the associated circuit path when the associated pulse-width-modulated signal is at its first and second levels, respectively,

the baseband signals being such that substantially all of the current at baseband frequencies flowing out of one or more of said loads at a given time flows into one or more of the others of said loads, and such that substantially all of the current at baseband frequencies flowing in said two or more circuit paths flows through the respective reactive load.

35. (Original) The invention of claim 34 wherein there are N of said circuit paths and wherein the phase of each of the baseband signals differs from the phase of one other of said baseband signals by 360/N degrees.

36. (Original) The invention of claim 34 wherein said circuit paths include circuitry in common that prevents current at at least said switching frequency from flowing through said loads.

37. (Original) The invention of claim 34 wherein said circuit paths include in common circuitry that isolates signals at at least said switching frequency from said loads.

38. (Original) The invention of claim 34 wherein said circuit paths include in common circuitry that cancels signals at at least said switching frequency.

39. (Original) The invention of claim 34 wherein said switching signals are in phase with one another at said switching frequency and wherein said circuit paths include respective ports of a common-mode inductor that cancels signals at at least said switching frequency, thereby preventing most of the energy in said switching signals at said switching frequency from being applied to said loads.

40. (Withdrawn) The invention of claim 39 wherein $N \geq 3$.

41. (Previously Presented) The invention of claim 34 further comprising a mechanical load connected to said transducer.

42. (Original) The invention of claim 41 wherein said mechanical load includes means for generating acoustic sonar signals.

43 – 51. Canceled.

52. (Withdrawn-Previously Presented) Apparatus comprising

means for generating at least first and second switching signals having the same switching frequency and having respective fundamental frequency components that have a particular phase relationship with one another and said first and second switching signals having respective baseband components at at least one baseband frequency that do not have said particular phase relationship with one another,

at least first and second reactive loads, at least one of said loads being a transducer,

a rejection filter that cancels signals applied to respective ports thereof that have said predetermined phase relationship, and

means for applying said at least first and second switching signals to respective circuit paths that include said at least first and second loads, respectively, and that include respective ports of said rejection filter, whereby signals at said fundamental switching frequency are isolated from said loads while said baseband components at at least said one baseband frequency are applied to said loads,

wherein substantially all of the baseband component of said first switching signal at said at least one baseband frequency is a current that flows into said first reactive load and substantially all of the baseband component of said second switching signal at said at least one baseband frequency is a current that flows into said second reactive load..

53. (Withdrawn) The invention of claim 52 wherein said fundamental frequency components are in phase with one another, said baseband components are the inverse of one another, and said rejection filter is a common-mode inductor.

54. (Withdrawn) The invention of claim 52 wherein

said at least first and second switching signals comprises at least first, second and third switching signals,

said apparatus further comprises a third reactive load, and

said apparatus further comprises means for applying said third switching signal to a respective circuit path that includes said third load and that includes a respective port of said rejection filter.

55. (Withdrawn) The invention of claim 54 wherein said rejection filter is a common-mode inductor.

56. (Withdrawn) The invention of claim 52 wherein said rejection filter is a common-mode filter, wherein said switching signals are phased in such a way that, and are applied to said common-mode filter in such a way that, said fundamental frequency components comprise a common-mode input signal for said common-mode filter and said baseband components are differential mode signals for said common-mode filter.

57. (Withdrawn-Previously Presented) The invention of claim 56 wherein a mechanical load is connected to said transducer.

58. (Withdrawn-Previously Presented) The invention of claim 57 wherein said mechanical load includes means for generating acoustic sonar signals.

59-62. Canceled.

63. (Previously Presented) A switching amplifier operating at a particular switching frequency, the switching amplifier comprising

at least first and second circuit paths,

each of said paths comprising switching circuitry, a load filter, a respective port of a common-mode inductor and a transducer, all connected in series, each transducer having a terminal that is connected to a power supply node in common with each other transducer, each load filter having a passband that includes said

particular switching frequency and having a stop band at frequencies higher than said particular switching frequency,

said switching circuitry being operative in response to a first pulse-width-modulated signal to cause first and second voltages of a first switching signal to be alternately impressed between the load filter of said first circuit path and said common node and being further operative in response to a second pulse-width-modulated signal to cause first and second voltages of a second switching signal to be alternately impressed between the load filter of said second circuit path and said common node,

said first and second switching signals having respective fundamental switching components that are of substantially equal magnitude and phase so that they are canceled by said common-mode inductor, said first and second switching signals each further having at least one respective baseband component, the baseband components of said first and second switching signals being such that substantially all of the current at baseband frequencies flowing out of one or more of said transducers at a given time flows into one or more of the others of said loads, and

substantially all of said at least one baseband component of said first switching signal being a current that flows into one of said transducers and substantially all of said at least one baseband component of said second switching signal being a current that flows into another of said transducers.

64. (Original) The invention of claim 63 wherein the phases and amplitudes of said baseband components are such that said currents add to zero at substantially all times.

65. (Previously Presented) The invention of claim 63 wherein said transducers have substantially equal impedance and wherein said baseband components are the inverse of one another.

66. (Previously Presented) The invention of claim 63 wherein said switching amplifier includes at least one power supply terminal and wherein said current flowing out of one or more of said transducers flows away from said power supply terminal and said current flowing into one or more of the others of said transducers flows toward said power supply terminal.

67. (Previously Presented) The invention of claim 63 wherein there are two of said transducers having substantially equal impedances and wherein the baseband components of said first and second switching signals are of substantially equal magnitude and are substantially the inverse of one another.

68. (Previously Presented) The invention of claim 67 wherein a mechanical load is connected to at least one of said transducers.

69. (Original) The invention of claim 68 wherein said mechanical load includes means for generating acoustic sonar signals.

70 - 78. Canceled